

Historic Property Survey Report for the Airfield at
**NASA Ames Research Center,
Moffett Field, California**



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TABLE OF CONTENTS

1.0	INTRODUCTION.....	1-1
1.1	Purpose and Scope of Report	1-1
1.2	Study Area Description	1-1
2.0	METHODOLOGY	2-1
2.1	Research Methods	2-1
2.2	Evaluation Criteria and Guidelines	2-1
2.2.1	Guidelines for Integrity Assessment	2-2
2.2.2	Guidelines for Identification of Character-Defining and Contributing Features.....	2-2
2.3	Previous Studies	2-3
2.3.1	U.S. Naval Air Station Sunnyvale Historic District	2-3
2.3.2	Other Established Significance Themes	2-3
3.0	SITE PHYSICAL HISTORY.....	3-1
3.1	Developmental History.....	3-1
3.1.1	Pre-airfield Period (to 1930).....	3-1
3.1.2	U.S. Navy Dirigible Operations (1931–1935).....	3-2
3.1.3	U.S. Army Air Corps (1935–1942).....	3-3
3.1.4	Navy Lighter-than-Air Operations and World War II (1942–1947)	3-3
3.1.5	Navy Transport Operations (1945–1950).....	3-4
3.1.6	Korean War and Navy Jets (1950–1961)	3-4
3.1.7	Navy Antisubmarine Warfare Operations (1962–1994)	3-5
3.1.8	Moffett Federal Airfield (1994–Present).....	3-6
3.1.9	National Advisory Committee for Aeronautics and NASA (1939–Present).....	3-6
4.0	INVENTORY.....	4-1
4.1	Overview of Existing Conditions	4-1
4.2	Airfield Features.....	4-1
4.2.1	Spatial Organization	4-1
4.2.2	Circulation	4-2
4.2.3	Buildings and Structures	4-2
4.2.4	Views.....	4-3
4.2.5	Archaeological Sites.....	4-4
4.2.6	Land Uses	4-4
5.0	EVALUATION	5-1
5.1	Statement of Significance.....	5-1
5.1.1	Period of Significance	5-1
5.1.2	Relevant Theme Studies and Contexts	5-1
5.1.3	Additional Considerations for Significance	5-2
5.2	Integrity Assessment	5-2
5.3	Identification of Historic Character and Character-Defining Features.....	5-4
5.4	Boundary Justification	5-6

6.0	TREATMENT	6-1
6.1	Management Context	6-1
6.2	Treatment Approach.....	6-1
6.3	Treatment Guidelines	6-2
6.3.1	Spatial Organization	6-3
6.3.2	Archaeological Resources	6-4
6.3.3	Views and Viewsheds	6-4
6.3.4	Circulation	6-4
6.3.5	Historic Buildings and Structures.....	6-4
6.3.6	Small-Scale Features	6-4
6.3.7	Land Uses	6-5
6.3.8	Topographic Modifications	6-5
6.3.9	Recommended Studies	6-5
6.3.10	New Construction.....	6-5
7.0	REFERENCES AND SOURCES CONSULTED	7-1

Figures

Figure 1.	HPSR Study Area	1-2
Figure 2.	Preliminary Map of Contributing Airfield Features	5-5
Figure 3.	Proposed Revised Boundary, NAS Sunnyvale Historic District	5-7

Appendices

A	Selected Historic Photographs
B	Selected Existing Conditions Photographs
C	Preliminary Inventory of Contributing Airfield Features
D	Period Plans

ACRONYMS AND OTHER ABBREVIATIONS

ACHP	Advisory Council on Historic Preservation
ARC	Ames Research Center
B.P.	Before Present
CANG	California Air National Guard
FASRON	Fleet Aircraft Service Squadron
HPSR	historic property survey report
HRPP	historic resources protection plan
ICRMP	integrated cultural resources management plan
LTA	lighter-than-air
NACA	National Advisory Committee for Aeronautics
NAS	Naval Air Station
NASA	National Aeronautics and Space Administration
NAS Sunnyvale Historic District	Naval Air Station Sunnyvale Historic District
Navy	U.S. Department of the Navy
NHPA	National Historic Preservation Act
NRHP	National Register of Historic Places
RFP	request for proposals
SHPO	State Historic Preservation Officer
U.S. 101	U.S. Highway 101

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1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE OF REPORT

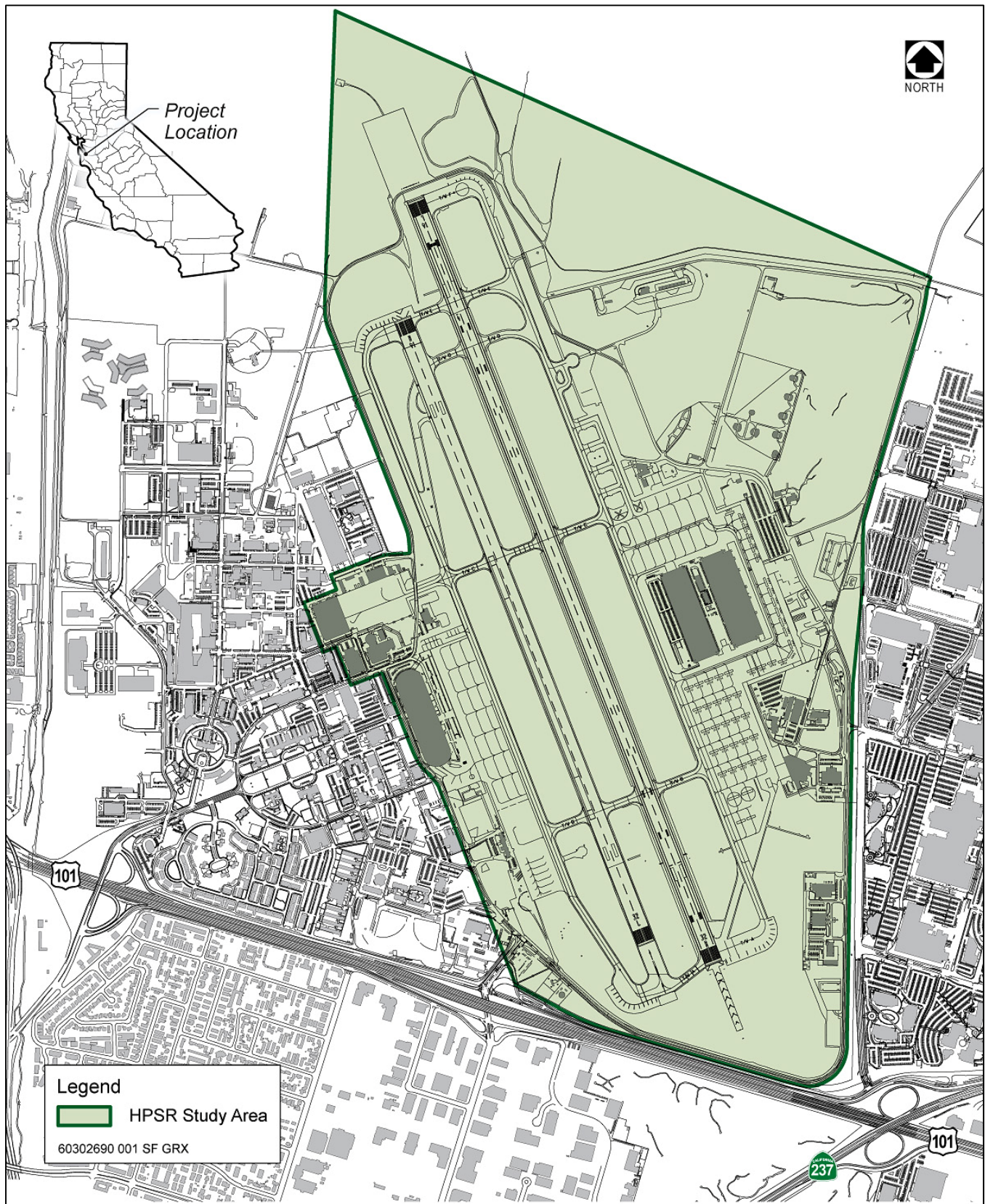
This historic property survey report (HPSR) was undertaken by AECOM on behalf of the National Aeronautics and Space Administration (NASA) Ames Research Center (ARC). The HPSR supports NASA's compliance with Section 110 of the National Historic Preservation Act (NHPA) and with other laws and regulations. This report has been prepared as part of ongoing consultation between NASA and the California State Historic Preservation Office (SHPO) regarding the National Register of Historic Places (NRHP) eligibility of the Airfield area of the NASA ARC as a contributing feature of the Naval Air Station Sunnyvale Historic District (NAS Sunnyvale Historic District). In addition, the HPSR will provide NASA and its potential tenant(s) or lessees with more specifics about which physical features of the Airfield are to be treated in accordance with historic preservation standards. The HPSR will be used to support the completion of consultation on NRHP eligibility with the SHPO, and will also to provide baseline information to potential lessees regarding the Airfield.

1.2 STUDY AREA DESCRIPTION

Located in Santa Clara County, California, on the south side of lower San Francisco Bay, the NASA ARC lies between the cities of Sunnyvale and Mountain View. Portions of the site now called NASA ARC have been known in the past as Naval Air Station (NAS) Sunnyvale and NAS Moffett Field (or Moffett Field). In this report, the facility is referred to by its appropriate historical name in the description of each historical period, and otherwise is generally referred to as NASA ARC.

Within NASA ARC there are several functional areas: the NASA Ames Campus in the northwest quadrant; the former U.S. Department of the Navy (Navy) housing and support area in the southwest quadrant; the NAS Sunnyvale, California National Register Historic District (NAS Sunnyvale Historic District) in the central area west of and including Hangar 1, as well as Hangars 2 and 3; and the Airfield area, including the munitions magazines and safety buffer zone, which compose the entire eastern half of the facility. The Airfield includes two parallel runways and associated Hangars 1, 2, and 3 and the safety buffer zone northeast of the runways.

The approximately 1,160-acre HPSR study area is bounded on the north by San Francisco Bay wetlands and salt ponds, on the west by the NAS Sunnyvale Historic District and the NASA ARC, at the south by U.S. Highway 101 (U.S. 101), and on the east by a heavily developed industrial park (see Figure 1, "HPSR Study Area").



Source: Data compiled by AECOM in 2013

Figure 1. HPSR Study Area

2.0 METHODOLOGY

The HPSR provides an overview of and justification for the eligibility of the Airfield for inclusion in the NRHP as an extension of the NAS Sunnyvale Historic District. The following sections describe the methods used to conduct further research on the context and site history of the Airfield, the sources and methods used to compile an inventory of the Airfield's historic-period components, identification of character-defining and contributing features, and the criteria applied during the evaluation of whether the Airfield is eligible for listing in the NRHP.

2.1 RESEARCH METHODS

The physical history of the Airfield was developed based on archival research completed at the NASA ARC Aviation Management Office and the Moffett Field Historical Society Museum. Archival materials collected from these repositories included historic drawings and photographs from the previous reports and studies, and Navy historical publications.

Section 4.0, "Inventory," was developed based on materials provided by NASA, consisting of a master inventory of all buildings and structures in the HPSR study area, site plans, and various reports and studies completed for the NASA ARC. The project team conducted an overview survey of the Airfield on June 13, 2013, for project scoping, and a reconnaissance survey on June 24, 2013. Project team members photographed buildings and structures in the study area that were constructed in 1963 or earlier (the 50-year cutoff). Because the scope of the HPSR is focused on providing a discussion of the character-defining features of the Airfield at SHPO's request, this report does not include comprehensive photo documentation or California Department of Parks and Recreation survey forms. For selected photographs, see Appendix A, "Selected Historic Photographs," and Appendix B, "Selected Existing Conditions Photographs."

2.2 EVALUATION CRITERIA AND GUIDELINES

Section 5.1, "Statement of Significance," defines the historic significance of the Airfield, including a period of significance, based on NRHP criteria. Properties listed in the NRHP must be significant to American history, architecture, archaeology, engineering, or culture, and must exhibit integrity of location, design, setting, materials, workmanship, feeling, and association. To be eligible for listing, a property must meet one or more of the following criteria:

- A. Be associated with events that have made a significant contribution to the broad patterns of our history
- B. Be associated with the lives of persons significant in our past
- C. Embody distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction
- D. Have yielded, or may be likely to yield, information important in prehistory or history.

In addition to considering significance as defined in the NAS Sunnyvale Historic District's NRHP nomination form and subsequent studies, several National Register bulletins were consulted during the evaluation of significance and the integrity assessment for the Airfield. National Register Bulletin 15, "How to Apply the

National Register Criteria for Evaluation” (NPS 1997), provided overall direction. Bulletin 15 outlines the evaluation criteria and discusses how to evaluate properties within applicable historic contexts, define the significance of historic properties, and evaluate their integrity. National Register Bulletin 18, “How to Evaluate and Nominate Designed Historic Landscapes” (NPS n.d.), and Bulletin 43, “Guidelines for Evaluating and Documenting Historic Aviation Properties” (NPS 1998a), also provided important guidance relevant to the HPSR study area.

2.2.1 Guidelines for Integrity Assessment

In Section 5.2 of this HPSR, the integrity of the Airfield is assessed based on a comparison of existing and historic conditions. The National Park Service defines integrity as the authenticity of a landscape’s historic identity, evinced by the survival of physical characteristics that existed during its period of significance. Historical integrity is evaluated to determine whether the characteristics and features that defined the landscape during the historic period are present. The seven qualities of historic integrity defined by the National Register Program are *location, setting, feeling, association, design, workmanship, and materials*. Of the seven qualities, the most essential for historic landscapes are setting, feeling, association, and design.

2.2.2 Guidelines for Identification of Character-Defining and Contributing Features

A primary goal of the survey is to identify the historic character of the Airfield’s landscape. *Historic character* is the quality of a historic landscape that imparts its historic associations, and is created by the assembly of *character defining features* that communicate the visual aspects, features, materials, and spaces associated with the property’s history. The Airfield has a distinctive character supported by the character-defining features that tell its story. Character-defining features are identified in Section 5.3.

Some features of the Airfield’s landscape may be identified as *contributing features* for NRHP listing purposes. These are discussed as they relate to historic landscape character in Section 5.3. This study provides a preliminary identification of contributing features, including those with known dates of origin within the historic period of significance, and known to retain integrity. Some smaller resources such as lighting, and those with an indirect relationship to significance such as roads and sidewalks, were not evaluated in this study. Also, please note that some types of landscape characteristics such as views and vegetation, despite helping to define historic character, are not technically eligible for the NRHP because of the NRHP’s narrower focus on buildings, structures, objects, and sites. These types of resources are addressed as “character defining” when relevant.

The difference between a *contributing feature* and a *character-defining feature* requires some explanation. According to the National Park Service *Guide to Cultural Landscape Reports*, a contributing feature is “a biotic or abiotic feature associated with a landscape characteristic that contributes to the significance of the cultural landscape” (NPS 1998b). Individual buildings, roads, vegetation (specimens, groups, or communities), or small-scale features are contributing features. Noncontributing features either are non-historic (postdating the period of significance) or have lost their integrity (because of condition issues or other factors). Within the set of contributing landscape features, character-defining features represent the following (NPS 1998b):

...[the most] prominent or distinctive aspect(s), quality(ies), or characteristic(s) of a historic property that contributes significantly to its physical character. Structures, objects, vegetation, spatial relationships, views...may be such features.... The term “character-defining feature” was conceived to guide the

appropriate treatment and management of historic structures (and later of cultural landscapes), so that features conveying historic character would be retained by treatment activities.

In addition, a recommended eligible boundary is identified for the Airfield site based on its significance and integrity.

2.3 PREVIOUS STUDIES

2.3.1 U.S. Naval Air Station Sunnyvale Historic District

The NAS Sunnyvale Historic District was listed in the NRHP in 1994. The district's periods of significance are 1930-1935 and 1942-1946, and it is listed under Criteria A and C in the areas of Architecture and Engineering/Military. Under Criterion A, the NRHP nomination describes the district as representing a "unique and significant episode in the development of U.S. naval aviation prior to World War II...one of two Naval Air Stations built to support lighter-than-air dirigibles during the 1930s" (Urban Programmers 1994). Under Criterion C, the district is considered a good regional example of military design in the Spanish Colonial Revival style. It encompasses the 1933 original installation area to the west of the Airfield, as well as the 22.5-acre discontinuous area containing Hangars 2 and 3, which are associated with lighter-than-air military aircraft in World War II. The NRHP nomination calls Hangars 1, 2, and 3 "excellent examples of early twentieth-century military planning, engineering and construction" (Urban Programmers 1994). Other contributing elements contained in the district include the original Spanish Revival buildings, as well as later buildings in the same style and International style buildings of the 1940s. In total, according to the NRHP nomination form, 40 buildings, one structure, and two objects contribute to the district, and 54 noncontributing buildings are present within its boundary.

Hangar 1 is noted on the NRHP nomination form as "a metal sheathed behemoth whose rounded shape is both the epitome of the aerodynamically influenced Streamline Moderne style as well as a stylistic cousin to the huge airship that originally berthed inside the mammoth hangar" (Urban Programmers 1994).

Although the 1994 nomination form does not clearly specify significance under Criterion A, a later study (NASA 2013a) identified its significance for association with important events in U.S. history. The NASA Web site for Hangar 1 notes that the NAS Sunnyvale Historic District has been determined eligible under "Criterion A for its association with coastal defense and naval technology that has made a significant contribution to the broad pattern of our history" (NASA 2012).

2.3.2 Other Established Significance Themes

A variety of additional designations and evaluations provide other aspects and types of significance recognition for the resources at the Airfield. For example, according to the NASA Web site for Hangar 1, "The historic significance of Hangar 1 was also recognized when it was designated a Naval Historical Monument. It has been designated a California Historic Civil Engineering Landmark by the San Francisco section, American Society of Civil Engineers" (NASA 2012).

In 2013, the NASA ARC submitted a statement of the Airfield's historical significance to the SHPO and the federal Advisory Council on Historic Preservation (ACHP). The Airfield and its component features were

determined to be eligible for the NRHP under Criterion A, and to contribute to the adjacent NAS Sunnyvale Historic District. The nomination has not been formally updated to include these areas.

Numerous other resources at NASA ARC have been identified as eligible, although they are also not listed in the NRHP. A 1998 study of Cold War resources at the Airfield provides eligibility determinations. Please see the table in the Appendix C, “Preliminary Inventory of Contributing Airfield Historic Resources,” for more information about the status of individual resources.

3.0 SITE PHYSICAL HISTORY

3.1 DEVELOPMENTAL HISTORY

3.1.1 Pre-airfield Period (to 1930)

The earliest well-documented entry and spread of native peoples throughout California occurred at the beginning of the Paleo-Indian Period (12,000–8000 years Before Present [B.P.]), and social units are thought to have been small and highly mobile. Known sites have been identified in the contexts of ancient pluvial lakeshores and coastlines, as evidenced by such characteristic hunting implements as fluted projectile points and flaked stone crescent forms. Prehistoric adaptations over the ensuing centuries have been identified in the archaeological record by numerous researchers working in the Bay Area since the early 1900s, as summarized by Fredrickson (1974) and Moratto ([1984] 2004).

Few archaeological sites have been found in the Bay Area that date to the Paleo-Indian Period or the subsequent Lower Archaic (8000–5000 B.P.) time period, probably because of high sedimentation rates and sea level rise. However, archaeologists have recovered a great deal of information from sites occupied during the Middle Archaic Period (5000–2500 B.P.). By this time, broad regional subsistence patterns gave way to more intensive procurement practices. Economies were more diversified, possibly including the introduction of acorn-processing technology, and populations were growing and occupying more diverse settings. Permanent villages that were occupied throughout the year were established, primarily along major waterways. The onset of status distinctions and other indicators of growing sociopolitical complexity mark the Upper Archaic Period (2500–1300 B.P.). Exchange systems became more complex and formalized, and evidence of regular sustained trade between groups was more prevalent.

Several technological and social changes characterize the Emergent Period (1300–200 B.P.). Territorial boundaries between groups became well established, and it became increasingly common for distinctions in an individual's social status to be linked to acquired wealth. In the latter portion of this period (500–200 B.P.), exchange relations became highly regularized and sophisticated. The clamshell disk bead became a monetary unit, and specialists arose to govern various aspects of production and material exchange.

The Middle Archaic, Upper Archaic, and Emergent Periods can be broken down further, according to additional cultural manifestations that are well represented in archaeological assemblages in the Bay Area:

- *Windmill Pattern* (5000–1500 B.P.) peoples placed an increased emphasis on acorn use and on a continuation of hunting and fishing activities. Ground and polished charmstones, twined basketry, baked clay artifacts, and worked shell and bone were hallmarks of Windmill culture. Widely ranging trade patterns brought goods in from the Coast Ranges and trans-Sierran sources, as well as from closer trading partners.
- *Berkeley Pattern* (2200–1300 B.P.) peoples exhibited an increase in the use of acorns as a food source, compared to what was seen previously in the archaeological record. Distinctive stone and shell artifacts differentiated this period from earlier or later cultural expressions. Burials were most often placed in a tightly flexed position and frequently included red ochre.
- The *Augustine Pattern* (1300–200 B.P.) reflected increasing populations, resulting from more intensive food procurement strategies, as well as from a marked change in burial practices and increased trade activities.

Intensive fishing, hunting and gathering, complex exchange systems, and a wider variety in mortuary patterns are all hallmarks of this period.

Ethnographic and archaeological research indicate that the NASA ARC falls within the traditional boundaries of the Ohlone, whose territory stretched from San Francisco Bay at the north to the southern tip of Monterey Bay, extending 60 miles inland (NASA 2002b). The primary social organization of this group was centered around the patrilineal family unit, with a focus on patrilocal, and sovereign tribelets were often defined by territorial holdings (Bennyhoff 1977). The NASA ARC is located on Ramaytush and Tamyen (Tamien) lands of the Ohlone sphere of influence and has been specifically associated with the Posol-mi tribelet (a place name likely associated with the Rancho Posolmi, below) (NASA 2009; Kroeber 1925). The total number of individuals residing in this area has been estimated to be as high as 1,200 at the time of European contact; however, the combined effects of missionization and European-borne diseases had a heavy toll on these communities, nearly decimating the population and traditional practices (NASA 2009).

In 1772, the Spanish, led by Juan Bautista de Anza, began exploring the inner coastal region of California. Later, Spanish settlers established a permanent presence by constructing missions and presidios. When Mexico became independent from Spain in 1822, the Spanish missions were secularized and their lands were redistributed to private individuals by way of land grants. Large parcels were developed into cattle ranches, maintained by Mexican grantees.

In 1844, the Rancho Posolmi, on which NASA ARC lands are contained, was granted to Lopez Iñigo (also Indigo or Ynigo), a Native American documented as living in the vicinity of present-day Mountain View and farming what would become NASA ARC lands as early as 1834 (NASA 2009; Garaventa et al. 1991). The grant was later patented in 1881, at which time the grant was known to have been divided into three parts: 448.02 acres to Iñigo's descendants, 847.98 acres to Robert Walkinshaw, and 400 acres to Thomas Campbell. Research indicates that the known remains of buildings associated with these ranchos are located outside of the NASA ARC land holdings. Iñigo is thought to have lived on-site until his death in 1864, and a marker entitled the "Inigo Grave Site" [*sic*] was erected by the Mountain View Pioneer and Historical Association on the perimeter road near the northeast corner of what was then known as NAS Moffett Field (Garaventa et al. 1991). Although the marker is no longer standing, Iñigo's interment is believed to be located within the boundaries of resource CA-SCI-12/H (see Section 4.2.5, "Archaeological Sites").

3.1.2 U.S. Navy Dirigible Operations (1931–1935)

The agricultural land that would become NAS Sunnyvale was purchased with funds raised by local citizens and civic leaders who were enthusiastic about the prospect of a naval airfield coming to the area. The civic group sold the land to the Navy for \$1, and NAS Sunnyvale was officially established on August 2, 1931.

Construction began on NAS Sunnyvale in October 1931 (see Appendix D, "Period Plans"). Hangar 1, the massive steel-frame structure built to house the dirigible USS *Macon*, the flagship for NAS Sunnyvale, was completed in April 1933. North and south of Hangar 1, two mooring circles were built to control and secure the *Macon*. The nose of the dirigible would attach to a telescoping mooring mast and the tail fin would attach to a stem beam (or bolster beam); the stem beam and mooring mast were attached to a track that allowed the *Macon* to be rotated and moved in and out of Hangar 1. West of Hangar 1, the Navy built a campus of buildings to support dirigible operations on the airfield. The Spanish Colonial-style buildings built in the area now known as the NAS

Sunnyvale Historic District were based on designs by the Naval Bureau of Yards and Docks. East of Hangar 1, closer to San Francisco Bay, the former agricultural land was cleared and leveled, and an airfield with a single narrow runway was built. This small runway was originally used by F9C *Sparrowhawks*, small biplane fighters that accompanied (and could be carried by) the USS *Macon*. Within a short time, the original runway was expanded and two more small runways were added. NAS Sunnyvale was formally commissioned on April 12, 1933.

The USS *Macon* arrived at NAS Sunnyvale in October 1933 and was stationed there until February 1935, when the dirigible was damaged during a mission off the coast of Point Sur, California, and crashed in the Pacific Ocean. Soon after the crash, the Navy terminated its dirigible program and the airfield at NAS Sunnyvale was transferred to the U.S. Army Air Corps.

3.1.3 U.S. Army Air Corps (1935–1942)

In September 1935, the Navy transferred the airfield to the U.S. Army Air Corps for use in pursuit and observation operations. When the Airfield was occupied by the Army Air Corps, the Airfield's focus moved from lighter-than-air (LTA) operations to heavier-than-air aircraft used in pursuit and training operations. The Army Air Corps used bigger aircraft that required longer and wider runways, including the P-36 *Hawk* and BT-13 *Valiant*. In 1938, the Army Air Corps removed the older runway system and built a 2,140-foot-long runway (Runway 14R-32L) using 3-inch-thick asphalt concrete. Historic photographs taken during this period show a wide runway bordered on the west side by an apron or taxiway marked by diagonal lines. Parking areas surrounding Hangar 1 were unpaved earth (Veronico 2006).

In 1940, anticipating the outbreak of World War II, the Army Air Corps converted the airfield to become its West Coast training headquarters. In 1941, to accommodate larger aircraft used to train pilots and their support crew, Runway 14R-32L was extended again.

3.1.4 Navy Lighter-than-Air Operations and World War II (1942–1947)

After the bombing of Pearl Harbor in December 1941, the Navy reassumed control of the airfield, which was renamed the U.S. NAS Moffett Field, or simply Moffett Field. LTA operations were needed by the military once again, and Moffett Field became devoted exclusively to LTA aviation, primarily for reconnaissance and surveillance of the Pacific coast. Moffett Field was the headquarters for Fleet Airship Wing Three, composed of three LTA bases on the West Coast: Tillamook, Oregon; Santa Ana, California; and Sunnyvale, California. The first blimps arrived at Moffett Field as part of the West Coast's first LTA squadron, ZP-32, which launched its first patrol flight over the Pacific coast in February 1942 (Veronico 2006). Moffett Field was also used to train new airship pilots, using free balloons and blimps.

With the increase in LTA activity at Moffett Field, Hangar 1 was once again filled to capacity with K- and L-class nonrigid airships. In 1942, construction started on the first of two new enormous wood-frame hangars on the east side of the runways, which by this time had been expanded and reconfigured by the Army Air Corps (see Appendix D). Hangars 2 and 3 were completed in 1943 and used by the Navy Station Assembly and Repair Department to assemble, erect, store, and maintain blimps and balloons (Gleason 1958). LTA operations continued at Moffett Field until August 1947 when the program was deemed obsolete and terminated, making Moffett Field an exclusively heavier-than-air base (Gleason 1958).

Also during this period, the Navy started to focus more attention on expanding the base, including adding facilities for ammunition storage and heavier-than-air aircraft. In April 1942, the Navy purchased 225 acres east of the airfield, presumably to construct an ammunition storage area (Gleason 1958). In 1943, the Navy built a large munitions storage and loading area off the northeast corner of the airfield. The Navy chose this area because most munitions arrived at the Airfield by boat along the ferry channel, and because that was the most lightly occupied part of the airfield (NASA 2013a). The munitions area included five magazines (now known as 070 to 074), a small bunker, an inert ammunition storage building, and nine fortified combat ammunition loading circles. The four magazines were concrete bunkers with cylindrical roofs set into a concrete front wall; lying 8 feet across from the door of these magazines was a matching berm with headwall that served as a blast deflector in case of accidental explosion. Concrete ramps were built to facilitate the transport of munitions from these magazines to the aircraft being readied for their missions. A safety buffer zone was outlined within the explosion arc of these magazines.

Beginning in 1943, the Navy started the first in a series of major changes to the airfield and surrounding areas after the Naval Bureau of Yards and Docks allotted \$1.12 million for new construction at Moffett Field (Gleason 1958). By this time, the Navy was flying larger and powerful aircraft such as the PV-1 *Ventura* and Army B-26 *Marauders*, which required more modifications to the runway (Veronico 2006). In May 1944, Runway 14R-32L was extended to its present length with 11-inch Portland cement concrete, anticipating greater use by fixed-wing aircraft in the postwar period (NASA 2013a).

3.1.5 Navy Transport Operations (1945–1950)

After World War II, Moffett Field became home to Squadron 4 of the Naval Air Transport Service, with support operations dedicated to aircraft maintenance and overhaul. It was during this period that most of the current-day airfield was built. Beginning in 1945, the Navy spent millions of dollars for improvements and new construction at Moffett Field (Gleason 1958) (see Appendix D). The airfield was expanded and extended to accommodate the Navy's largest transport aircraft, including a huge four-engine transport plane called the R5D *Skymaster* (Gleason 1958). In 1946, Runway 32R-14L was built of 8-inch-thick reinforced concrete to an original length of 7,425 feet. The west and east parallel taxiways were built, along with many of the parking aprons. In 1947, high-intensity approach, taxiway, and runway lights were added to the airfield (Gleason 1958) (see Appendix D). In the late 1940s, two more air transport squadrons (Squadrons 3 and 5) were commissioned at the base, making Moffett Field the largest Naval Air Transport Service base on the West Coast. Squadron 5—the first squadron in the Navy to have nuclear-weapon capabilities—flew the large patrol bombers P2V *Neptune* and AJ *Savage* (Gleason 1958).

Moffett Field's Naval Air Transport Service overhaul and repair operations were closed down in October 1949 (Gleason 1958).

3.1.6 Korean War and Navy Jets (1950–1961)

The Korean War started in June 1950 and Moffett Field became the home base for aircraft carrier squadrons and their fighter jets. Jets were first introduced by the U.S. military during World War II, but did not appear at Moffett Field until 1950 with the arrival of the F3D *Skynight*, the Navy's first operational jet night fighter. Navy carrier squadrons stationed at Moffett Field used the airfield for training purposes, including simulated carrier landings. (Runways were equipped with emergency arresting gear similar to the equipment used to stop planes on aircraft carriers.) Moffett Field was also used to train pilots on new jet aircraft before they were first introduced into operational squadrons. Almost every new supersonic jet fighter aircraft in the Navy or U.S. Air Force inventories

in the early 1950s was flight-tested at Moffett Field (NASA 2013a). To support the new jets stationed at Moffett Field, two new squadrons were commissioned in March 1951 to provide maintenance services: Fleet Aircraft Service Squadron (FASRON) 10 was one of the first all-jet Fleet Aircraft Service squadrons in the Navy. One of its main roles was to repair damaged aircraft serving in the Pacific Fleet. The FASRON groups used Hangars 2 and 3 for maintenance operations.

In June 1951, to accommodate jet operations at Moffett Field, the Navy embarked on the largest post–World War II expansion program at the airfield (see Appendix D). Because jet aircraft flew much faster and at higher altitudes than propeller-powered aircraft, the airfield at Moffett Field needed to be modified.

Both runways were extended and resurfaced at least once; Runway 32R-14L was extended to 9,200 feet (Navy 1954). Taxiways were expanded, parking and apron areas were added, and new supply, transportation, garage, and barracks buildings were constructed (Gleason 1958). The Flight Operations Building (158) was completed in February 1954 (Gleason 1958). In October 1956, a cutting-edge, high-speed refueling system (MF1003) was added to the apron area north of Hangar 2. This system allowed eight aircraft to be refueled simultaneously at the rate of 5 minutes per plane.

The northeast area of the airfield near the coastline and magazines also saw changes during this period. Three new high-explosive magazines were built along Marriage Road (143, 147, and 528), and an ordnance handling pad (442) was added to the northeast side of the airfield. In 1953, an extensive fuel transport and storage system was completed. The barge canal, dock, wharf, and pipeline system enabled the Navy to bring in large amounts of fuel by barge directly from the refinery, rather than by truck or railroad; fuel was piped from the barge to underground storage tanks in the fuel farm east of Hangar 3, saving time and money. In 1960, a golf course was built within the safety buffer zone surrounding the magazines as an acceptable low-occupancy use (NASA 2013a).

Jet operations at Moffett Field were so extensive that the base was designated a master jet base in 1953 (the first of nine such Navy bases), and operational units on-site reached an all-time high in 1955. However, by the early 1960s, the Navy’s operational priorities had changed, and the focus shifted from fighter jets to anti-submarine warfare. Jet operations at Moffett Field ended in 1961.

3.1.7 Navy Antisubmarine Warfare Operations (1962–1994)

In November 1962 Moffett Field was selected as the West Coast’s training center for the Navy’s anti-submarine warfare in the Pacific Ocean. The training was centered on the new propeller-driven anti-submarine aircraft, the Lockheed P3 *Orion*. The Pacific Fleet’s first *Orion* arrived at Moffett Field in late January 1963, and for the next three decades the P3s would be a common sight over Moffett Field (Navy 1963). Pilots and technical crews were trained on the *Orion* in an area of the airfield nicknamed “Orion University,” two World War II buildings in the California Air National Guard (CANG) outlease area reconfigured for this use (654, 655, and 669) (see Appendix D).

The P3 *Orion* had an internal bomb bay that could house torpedoes, nuclear weapons, and various other mines, missiles, and bombs. To store the weapons used for the *Orion* missions, specifically Mark 46 torpedoes, cluster bombs, and Bullpup or Harpoon missiles, the Navy added a new magazine facility to the safety buffer zone in 1965 (561 and 484-492). In 1973 Moffett Field became the headquarters of the Commander Patrol Wings, U.S.

Pacific Fleet, responsible for patrolling 93 million square miles of ocean from Alaska to Hawaii (see Appendix D).

In 1991, the Base Realignment and Closure Commission recommended the closure of Moffett Field as a naval air station. On July 1, 1994, Moffett Field was closed to military operations, renamed Moffett Federal Airfield, and transferred to NASA (with the exception of the military housing units, which were transferred to the U.S. Air Force).

3.1.8 Moffett Federal Airfield (1994–Present)

The munitions storage area is currently used to support operations of the CANG 129th Rescue Wing, and to store explosives used by NASA ARC researchers working on the research gun ranges, both the horizontal ballistic ranges and the vertical impact gun range. It also encompasses the Moffett Golf Course, a full 18-hole regulation course that is open to federal and military personnel and retirees and is currently managed by the Ames Exchange. The golf course site is a critical portion of the 28% of green space required in the NASA ARC's programmatic environmental impact statement and record of decision (2002) for the *NASA Ames Development Plan*. There are plans to rebuild some magazines to prevent the explosive safety arc area from impinging on the San Francisco Bay Trail, in line with local, state, and federal efforts to open the Bay Trail to the public (see Appendix D).

3.1.9 National Advisory Committee for Aeronautics and NASA (1939–Present)

In December 1939, the National Advisory Committee for Aeronautics (NACA) began construction of the Ames Aeronautical Laboratory off the northwest corner of the airfield. One of the first buildings constructed at Ames Aeronautical Laboratory was a hangar for research aircraft, now called the Flight Research Facility N210, marking the beginning of NACA's (and later NASA's) association with the airfield. In October 1940 NACA's first research aircraft—a North American O-47 observation plane—arrived at the airfield. By 1941, some of NACA's now-famous wind tunnels were complete and in operation, testing airflow of high-speed fighter aircraft during World War II.

In the mid-1940s, NACA added a second aircraft hangar (N211) to supplement N210 and extended the ramps and taxiways connecting the airfield to the NACA area. Around this time NACA was constructing more wind tunnels and had started a vigorous flight test program on the airfield. One such program, focusing on deicing technologies, won the Collier Trophy in 1946 and validated technology important to the air war in the Pacific during World War II.

The airfield improvements during the Navy Transport period (1945–1950), especially the addition of a longer runway (32R-14L), allowed a significant expansion in NACA's flight test program. Soon after the end of World War II, the NACA flight test program focused on problems with high-speed aircraft. Before Chuck Yeager broke the sound barrier in the Bell X-1 in 1947, NACA test pilot George Cooper (a fighter pilot with the Army Air Force in World War II) broke the sound barrier in dives of aircraft over Moffett Field. The supersonic research carried out by NACA at Moffett Field in the 1940s resulted in some of the most significant advancements in aeronautical engineering up to that time (Anderson n.d.).

NACA was renamed NASA in 1958. In the 1960s, the NASA ARC continued its research program, the airfield was the site of extensive research into short takeoff and landing technologies and vertical takeoff and landing

aircraft. In 1965, the Army located its Aeromechanics Laboratory at Moffett Field, and the airfield became the primary site for research on helicopters during the latter years of the Vietnam War. In the mid-1970s, NASA made a major commitment to advancing the technology of tilt-rotor aircraft, and the XV-15—the forerunner of the V-22 *Osprey*, which is now in service with the U.S. Marine Corps along with the U.S. Air Force inventory throughout their theaters of operation—was test-flown at Moffett Field.

The NASA ARC hosted a fleet of airborne science aircraft at Moffett Field that made major discoveries in the discipline of infrared astronomy, and on which the earliest instruments for high-altitude observation of Earth were validated. The airfield became the staging area for some of the most significant earth sciences missions of the 1970s and 1980s.

In 1998 the aircraft that NASA ARC used for earth science and infrared astronomy were transferred to the Dryden Flight Research Center. NASA's flight test helicopters remained at Moffett Field, and the airfield found other uses.

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4.0 INVENTORY

4.1 OVERVIEW OF EXISTING CONDITIONS

The Airfield is part of the NASA ARC at Moffett Field, located on the south shore of San Francisco Bay, 35 miles south of San Francisco. The NASA ARC is situated between the Santa Cruz Mountains to the west and the foothills of the Diablo Range to the east. Immediately north of the NASA ARC is an extensive series of wetlands and historic salt ponds. Vehicular access to the NASA ARC is from U.S. 101, a major south-north artery running from California to the state of Washington. Approximately 1,780 acres compose the NASA ARC; the Airfield, with all its component features, occupies 971 of these acres.

The Airfield encompasses features directly associated with the facility's historic core area, which served aircraft, transport, research, maintenance, and training missions, and which has evolved to continue to serve these uses throughout its history. The Airfield's historic features have enabled its ongoing use by dirigibles, balloons, airplanes, rotorcraft, and jets over the decades. These features include circulation elements used by aircraft, such as runways, taxiways, parking mats, compass calibration pads, ramps, repair aprons, and hardstands; buildings used to house aircraft, such as hangars; and buildings and structures involved in aviation operations, such as fuel transport and storage systems, repair shops, control towers, and aids to navigation (such as airport lighting).

Many of the surrounding areas are closely related to—if not directly a part of—the Airfield. Related features include research and training facilities that rely on their adjacency to aviation areas, as well as those that indirectly support aviation functions, such as administrative facilities; open spaces that provide safety buffers between the flight zone and munitions storage; and hazardous elements of a military airfield such as fueling areas, munitions storage and loading, and areas used by test vehicles.

4.2 AIRFIELD FEATURES

The spatial organization, circulation, historic buildings and structures, views, archaeological sites, and land uses at the Airfield are described below, including a description of existing conditions and brief overview of their evolution over time.

4.2.1 Spatial Organization

Spatial organization is the arrangement of elements that define and create spaces in the landscape. This is an essential aspect of a functional landscape such as the Airfield, because much about the Airfield's appearance today is driven by the patterns needed to support the spatial requirements of historic functions. The landscape has been dedicated to aviation uses since the inception of NAS Sunnyvale in the early 1930s, and the Airfield continues to be arranged to support this use today. When first constructed, the installation was centered on Hangar 1 and the associated dirigible-mooring circles to the north and south. Less than a decade later, the focus had moved to the east after the U.S. Army Air Corps constructed the first iteration of the Airfield's modern runway system. The spatial organization that exists in 2013 was largely established in the mid-1940s after construction of Hangars 2 and 3, the safety buffer zone, the magazines in the far northeast corner of the property, and the area south of Hangars 2 and 3 that now encompasses the CANG site.

Spatially, the Airfield is composed of the following features: the broad, open runways and associated taxiways, compass calibration pad, aircraft parking aprons at hangars, and refueling pads; the monolithic Hangars 1, 2, and 3 that frame the runways on two sides; the open landscape of the safety buffer zone surrounding the group of earthen-bermed ammunition magazines and associated structures to the northeast, including a golf course with a few buildings; the CANG area, including a hangar and open paved aircraft parking apron; and the NASA/NACA hangars with a similar aircraft parking apron.

The Airfield's landscape is defined along most of its edges by the groups of buildings in adjacent areas, including the three large hangars and the CANG and NACA/NASA buildings. Many of these date to the historic period; their massing and location help define the extent of the aviation areas as they have existed over decades.

4.2.2 Circulation

Circulation on the Airfield is defined primarily by the aviation features such as runways and taxiways. There are also vehicular roads and associated pedestrian sidewalks.

The runway system has two main taxiways at the east and west edges and six shorter taxiways crossing the concrete runways perpendicularly. There are five major parking aprons (or ramps): directly east of Hangar 1, north of Hangars 2 and 3, north of Hangar 1 at the NACA/NASA site, at the former high-speed fueling pits on the northeast side of the runways, and in the CANG area.

The vehicular roadways are an important feature of the Shenandoah Plaza area in the current NAS Sunnyvale Historic District, forming a symmetrical, Beaux-Arts circulation pattern that drives the layout of the buildings in the area. However, the roads in the Airfield area are secondary to aviation circulation in the landscape, and have been so throughout the installation's history.

The NASA ARC and the Airfield are accessed by two primary entrances, one on Moffett Boulevard and one on Ellis Street—both major exits off U.S. 101. The Airfield is encircled by a single contiguous loop road that, starting west of Hangar 1, is called Cummins Road. As the road encircles the Airfield to the south it becomes Macon Road, wrapping around the south end of the runways and Hangars 2 and 3, then heading north to the northernmost magazine in the safety buffer zone. Secondary roads in the Airfield area consist of the East Patrol Road, which follows the easternmost boundary of NASA property; Marriage Road, which bisects the southern magazine area and the golf course; the North Perimeter Road, which wraps around to the north of the runways and back south toward Hangar 1; and Zook Road, which runs along the westernmost border of the Airfield until it connects with Cummings Road to the west of Hangar 1. These roads are generally two lanes and paved with asphalt; some have associated sidewalks and concrete curbs. The paving and configuration of many of the roads in the Airfield area have changed over time as runways were extended and other aviation use-driven functions evolved. There are smaller roads as well, such as the one leading from the safety buffer zone to the ordnance handling pad; access roads within the CANG area; vehicular parking areas; and a road leading between Hangars 2 and 3.

4.2.3 Buildings and Structures

An inventory of contributing buildings and structures that lie within both the current NAS Sunnyvale Historic District and the Airfield's proposed extension is provided in Appendix C. This inventory lists the name and

facility number for each feature and indicates the current use of that feature. The inventory also indicates whether each feature is believed to contribute to the Airfield's significance, and thus supports the Airfield's qualification for listing in the NRHP.

The most visible buildings and structures at the Airfield continue to be the ones that have been present since the historic period of significance. Buildings and structures at the edges of the open aviation areas provide a visual break and a spatially defined edge to the open runway, taxiway, and apron areas. Most of the views at the Airfield are dominated by the massive steel-frame structure of Hangar 1, which also serves as the anchor to the west side of the runway system. The vast Hangars 2 and 3, with their wood-frame structures and aluminum panels, are equally imposing, anchoring the east side of the runways. More than a hundred other buildings and structures, both historic and nonhistoric, stand within the Airfield area. Of these, a few in addition to the large hangars stand out as unique. For example, the north and south floodlight towers (Buildings 32 and 33, constructed in 1934) served as original aviation-operation buildings in the 1930s. Another building in the study area that merits mentioning is Airfield Flight Operations Building 158, located south of Hangar 1 and used for all communication and navigation related to airfield activity. Constructed in 1954, the Airfield Flight Operations Building is a two-story concrete building with a three-story observation tower. Other unique structures at the Airfield include the bunker-like "igloo"-style ammunition magazines constructed in 1943, and a fuel-distribution system constructed in the 1950s, which includes a berthing wharf and pier, pipes, bridges, storage tanks, and high-speed fueling pits.

The portion of the Airfield with the most buildings constructed after 1963 is the CANG area, located in the southeast corner of the Airfield. Although the CANG area contains some buildings constructed before 1963, most of the buildings were constructed in the 1970s and 1980s. Aside from Hangars 1–3, the CANG buildings are the largest buildings within the Airfield. The CANG area contains various administrative and aviation-operations buildings, an expansive modern hangar building constructed in 2003, maintenance and storage buildings, and a building dedicated to CANG civil engineering. Post-1963 buildings located within the safety buffer zone surrounding the original 1940s magazines include a large magazine to the north with seven magazines constructed in 1965, a missile magazine added in 1976, and miscellaneous associated facilities. Another magazine was added adjacent to the original 1940s magazines in 1970. Other areas within the Airfield that contain post-1963 buildings include the alley between Hangars 2 and 3 and the areas north and northeast of the hangars; the fuel farm area east of Hangars 2 and 3; the golf course; and a small handful of buildings west of the runways.

Many of the fueling features appear to no longer be operational and their individual conditions and historic integrity have not yet been determined. All other existing buildings, structures, and features at the Airfield are related to operations and communications, training and operations (CANG), storage, utilities, security, and entertainment (golf course).

4.2.4 Views

Views of Hangar 1 are considered paramount at the Airfield, and are available from many locations. Hangar 1 can also be seen from U.S. 101, and it is widely recognized as an iconic Bay Area landmark. Notable views of Hangar 1 include those from the main gate entrance at Moffett Boulevard to the NASA ARC; from the runways; and from Hangars 2 and 3. Another notable view at the Airfield is the expansive, open view from the south end of the runways looking north toward San Francisco Bay. The panoramic view of the entire Airfield from the control tower at the Flight Operations Building is also important.

4.2.5 Archaeological Sites

Archaeological sites that have been found at the NASA ARC provide a context for understanding what other as-yet-undiscovered sites may be encountered (for example, during construction or other ground-disturbing activities). A total of 10 archaeological sites are reported to be located within the boundaries of the former Moffett Field and the NASA ARC: CA-SCI-12/H, CA-SCI-14 through CA-SCI-17, CA-SCI-19 through CA-SCI-21/H, CA-SCI-24, and CA-SCI-18/H (Garaventa et al. 1991; NASA 2002b). Most of these resources were recorded in 1912, but the Basin Research investigation (Garaventa et al. 1991) states that few have been reidentified, although multiple field investigations have been conducted. One possible exception is Resource CA-SCI-20H, composed of a diffuse scatter of shell fragments, but a specific aboriginal use or cultural association could not be determined.

Historic maps suggest that archaeological deposits related to a landing and connecting road, stage stop, and dwellings dating to the 1850s to the 1890s may be present near the Airfield. The 1991 Basin Research study failed to identify these and concluded that none of the sites within Moffett Field appeared eligible for inclusion in the NRHP (Garaventa et al. 1991; NASA 2002b). With the exception of Resources CA-SCI-12/H, CA-SCI-21, and CA-SCI-24, these sites were reported to be near the airfield, and have likely been long since destroyed. Basin Research further stated that, given the level of disturbance caused by the installation of modern infrastructure (electrical and telephone distribution systems, water and sewer systems, and gas lines), little potential exists for encountering intact archaeological resources.

4.2.6 Land Uses

During the decades since its inception in 1930, the Airfield has been used for a variety of aviation purposes, serving LTA craft (dirigibles, balloons, and blimps), airplanes, jets, and rotorcraft. In recent years, NASA has continued to use the Airfield without major modifications. Existing military tenants continue to be based at existing facilities, and to use the Airfield for aviation training; local police and county sheriff's departments base their patrol helicopters there as well. In addition, the Airfield is used by private entities to transport satellites to launch facilities, and transport patients and organs to local hospitals. The Airfield is often used by transient military aircraft, by NASA aircraft conducting flight research, and aircraft from the 89th Military Airlift Wing. Also, Aero Flight Dynamics Directorate helicopters occupy the NASA ramp at N248 and use the Airfield. None of the current land uses have required the addition of intrusive new construction that would diminish the character and setting of the Airfield and its historic contextual relationships to adjacent historic properties.

5.0 EVALUATION

5.1 STATEMENT OF SIGNIFICANCE

The Airfield is nationally significant under Criterion A as the central core facility of aviation-related research programs, as well as significant transport, training, and other aviation uses at the property. The Airfield's landscape is composed of a collection of buildings and structures that contribute to the adjacent NAS Sunnyvale Historic District under Criterion A. The Airfield's inclusion in the existing historic district expands the district's currently defined significance to include World War II and ongoing use of the Airfield for Cold War-era NACA, NASA, and military missions.

5.1.1 Period of Significance

The NAS Sunnyvale Historic District was listed in the NRHP under Criteria A and C in the areas of Architecture and Engineering/Military with a period of significance of 1930-1935 and 1942-1946; the Airfield and all building and structures located within that area were excluded from the district boundary.

The Airfield and its contributing features appear to be eligible for listing in the NRHP under Criterion A as an extension of the NAS Sunnyvale Historic District. Furthermore, it is recommended that the period of significance under Criterion A for the NAS Sunnyvale Historic District should be revised to 1930-1961. This revised period of significance reflects the significant modifications to the Airfield that occurred between 1935 and 1942—a period initially excluded from the NRHP nomination—and adds 1946-1961, which corresponds to the Airfield's continuous association with significant Navy and NASA missions during World War II and subsequent early NACA/NASA missions during the Cold War. The revised period of significance (1930 to 1961) would primarily apply to those features within the district that functionally relate to the operations of the Airfield.

As discussed previously in Section 3.1, "Developmental History," the current form of the runways began to take shape as the Airfield was modified to accommodate heavier-than-air craft for the U.S. Army Air Corps beginning in the mid-1930s. This modification included removing the older LTA runways and introducing Runway 14R-32L in 1938. With the introduction of the major runway that would shape the configuration of the Airfield as it is still seen today, the period of significance justifiably includes the years between 1935 and 1942, which were omitted from the original NAS Sunnyvale Historic District NRHP listing. The Airfield continued to take on its current configuration with major building campaigns in 1945 (for the Navy transport missions) and 1951 (for the Navy jets' missions). Changes to the configuration of the aviation areas over time reflect changing technologies and needs. These changes retained the Airfield's place at the cutting edge of scientific and aviation research and permitted its continuing use. Therefore, the changes throughout the period of significance are part of the site's character and reflect its central function.

5.1.2 Relevant Theme Studies and Contexts

Resources associated with the Airfield are mentioned in a National Park Service National Historic Landmarks theme study, *American Aviation Heritage*, which identified Moffett Field as significant. It was recommended for further study as an important representative of military aviation, specifically LTA craft, for the World War II period (1939–1945) (NPS 2004):

During World War II, the field at Sunnyvale, commonly known as Moffett Field, served as the navy's west coast lighter-than-air operations center and as the headquarters for the Commander, Fleet Airships Pacific. It also served as the primary training site for blimp pilots in the United States, all free balloon (untethered) training, and as an assembly center for Goodyear blimps from approximately 1942 to 1944. Now known as the NASA Ames Research Center, NASA administers the field's historic resources including three dirigible hangars: Hangar #1, the original hangar built in 1932 for the storage of the airship Macon and training World War II airship pilots, and the World War II era Hangars #2 and #3.

Context studies help to place the Airfield within the bigger picture of significant events and movements in American history. A major study of this type is the *NASA-wide Survey and Evaluation of Historic Facilities in the Context of the U.S. Space Shuttle Program: Roll-up Report*. In addition, the ACHP provided a "Program Comment for World War II and Cold War Eras (1939–1974) Ammunition Storage Facilities" that provides references to context and guidance on historic ammunition facilities, which may apply to the magazines located on the northeastern portion of the Airfield (ACHP n.d.).

5.1.3 Additional Considerations for Significance

Ongoing operations at the Airfield since 1961 continue to carry the mission of the facility forward. This continuing use, however, is not considered to confer eligibility, because of the 50-year cutoff for NRHP eligibility. The property has not been identified as exceptionally significant for events after 1961, so Criterion Consideration G (for significant sites less than 50 years old) is not applicable. However, the passage of time may render later events at the Airfield significant as researchers gain historical perspective on the value of these events to the bigger picture of American history. It is therefore recommended that the significance be periodically reevaluated to determine whether the end date should be moved forward.

5.2 INTEGRITY ASSESSMENT

The Airfield's landscape is defined to a great degree by its continuous evolution to serve the needs of aviation research for nearly a century. The layout of aviation areas has been modified over time to accommodate new types of aircraft and allow the facility to continue to carry out its historic mission of cutting-edge aviation research. As the ACHP notes (ACHP 1991):

Many of the facilities and much of the equipment associated with scientific or engineering advancements remain in active use today, but need to be continuously upgraded and modified to stay at the cutting edge of technology.... a balance must be struck between the needs of active scientific and technological facilities and the need to preserve the physical evidence of America's scientific heritage.

The U.S. Army Corps of Engineers, in *Guidelines for Documenting and Evaluating Historic Military Landscapes: An Integrated Landscape Approach* (Loechl et al. n.d.), identifies the ongoing use of historic facilities as an important aspect of retaining their integrity. If consistent use continues to sustain these functional landscapes, some changes to the physical fabric to support the ongoing historic core mission (and similar or related uses) are expected and may not detract from the historic integrity of the property. Also noted in this study are the differences between "core" mission facilities, which are essential to the historic purpose of the landscape, and support facilities, which are secondary. When considering issues of significance and integrity, core facilities are considered more crucial to sustaining this type of historic landscape's historic identity (Loechl et al. n.d.).

As a result, sites such as the Airfield (significant historic military, scientific and technological resources) have a greater degree of flexibility than some other kinds of historic properties to allow judicious, thoughtful changes to support ongoing uses. The upgrading of obsolete aviation features to continue the mission of the Airfield does not have the same negative impacts to integrity that would occur should unrelated new construction destroy historic aviation features. Because the changes have accrued in a way that retains the relationships among the Airfield's character-defining features and supports its ongoing aviation missions, the property retains overall integrity. Historic integrity would not be diminished by interior changes to buildings and structures within the District that contribute to Criterion A (that is, buildings and structures lacking NR design significance), if they are not individually listed. The primary function of these resources as character-defining features is their exterior massing and character in the larger landscape of the Airfield. Likewise, typical changes to non-contributing buildings and structures that would be necessary to support ongoing uses are unlikely to have an impact on the integrity of the overall district, although this should be guided by future preservation planning projects and guidance (such as found in an Integrated Cultural Resources Management Plan [ICRMP]).

The Airfield retains its integrity of location because it remains in its original geographic location. Its setting has been slightly diminished by new development in the vicinity since the 1960s. Still, the visual relationships—most importantly to Hangar 1, but also to the bay and salt ponds to the east and north, and to Shenandoah Plaza and other features of the NAS Sunnyvale Historic District to the west—remain similar to their historic appearance before 1961, and continue to define the site's setting as they have since the 1930s. Therefore, integrity of setting is retained.

The Airfield's integrity of feeling is retained because the ongoing aviation use of the property and the associated features and activities evoke a sense of its continuing historic use, even though the military airship period is long past. In recent years, commercial airship use has provided continuity of historic activities, which also supports integrity of feeling.

The Airfield retains integrity of association because Hangar 1 and other character-defining features are present to represent the many different significant aviation activities that occurred there throughout the historic period.

Integrity of design is retained, and remains most evident in Hangars 1, 2, and 3 as well as other buildings and structures. The integrity of design related to Hangar 1 has been somewhat diminished because of the loss of the exterior cladding of the structure; it resembles its historic appearance less closely with the siding missing. However, this is a reversible condition, because the siding may be replaced. Although some larger landscape features such as the aviation paved areas have changed substantially since the 1930s, they have changed only slightly since the end of the period of significance in 1961. Specific safety-related historic design associated with these kinds of facilities is evident in the layout and features of the munitions storage area, such as the bermed "igloo" storage bunkers and the use of a buffer zone of standard width to ensure that safety objectives for facility design were met.

Integrity of workmanship and materials have both been diminished because of the loss or replacement of materials such as aviation area paving and the siding of Hangar 1; however, these aspects are less important to the integrity of large landscapes such as this (as noted in National Register Bulletin 40 [NPS 1999]).

5.3 IDENTIFICATION OF HISTORIC CHARACTER AND CHARACTER-DEFINING FEATURES

The Airfield encompasses the features directly associated with the Airfield's core aviation mission, which has evolved throughout its history. These features include facilities that served the station's dirigibles, balloons, airplanes, and rotorcraft from the Airfield's construction in 1930 through World War II and the early NACA/NASA years. Many of the features in surrounding areas, though not part of the Airfield, are closely related to it. These include research and training facilities that rely on their adjacency to aviation features, as well as resources such as administrative facilities that indirectly support aviation functions. In addition, views to Hangar 1 from all areas are widely recognized as significant, because Hangar 1 is an iconic landmark in the broader landscape including the NASA ARC and beyond.

The large-scale, monolithic, high Modern appearance of Hangar 1 and the utilitarian, hard-edged character of the Airfield create a distinctive contrast with the finer-textured Shenandoah Plaza area with its Spanish Colonial–Revival architecture, symmetrical road system, and formal plantings. The visual character of the Airfield area throughout the Airfield's history has been open and expansive, hard-surfaced, and functional. The runways were historically large, flat, open, linear features designed to be highly visible from the air, oriented for optimal takeoff and landing based on prevailing winds and surrounding topography. The size and configuration of aviation features were modified over time, driven by the requirements of different types of aircraft that were in use. In the 1930s, Hangar 1 was the central feature of the dirigible-focused aviation area, with tracks extending from its end doors to mooring circles on the north and south. As the Airfield's mission left LTA craft behind and shifted to focus on airplanes and rotorcraft, the small runway system became more important and the tracks and mooring circles were removed. The runway system expanded to a large rectangular field in the 1940s and then gained more well-defined circulation, with longer runways and adjacent taxiways, as it was extended to accommodate additional aircraft types through the 1950s. Throughout these alterations, the Airfield's relationship to and views of Hangar 1 have remained its dominant character-defining feature.

Some contributing buildings and structures are noted below as they relate to the Airfield's historic landscape character. A preliminary inventory of contributing features is provided in Appendix C. This table lists the buildings and structures located within the Airfield area that are known to date to the period of significance, retain integrity, and relate to the significance of the Airfield and/or the existing NAS Sunnyvale Historic District. Some secondary features, such as roads and sidewalks, lighting, belowground features, pipes associated with former fueling systems, and antennae were not evaluated at this time because of the limited availability of information about their integrity and relationship to significance.

Character-defining features of the Airfield are as follows (Figure 2, "Airfield Contributing Features"):

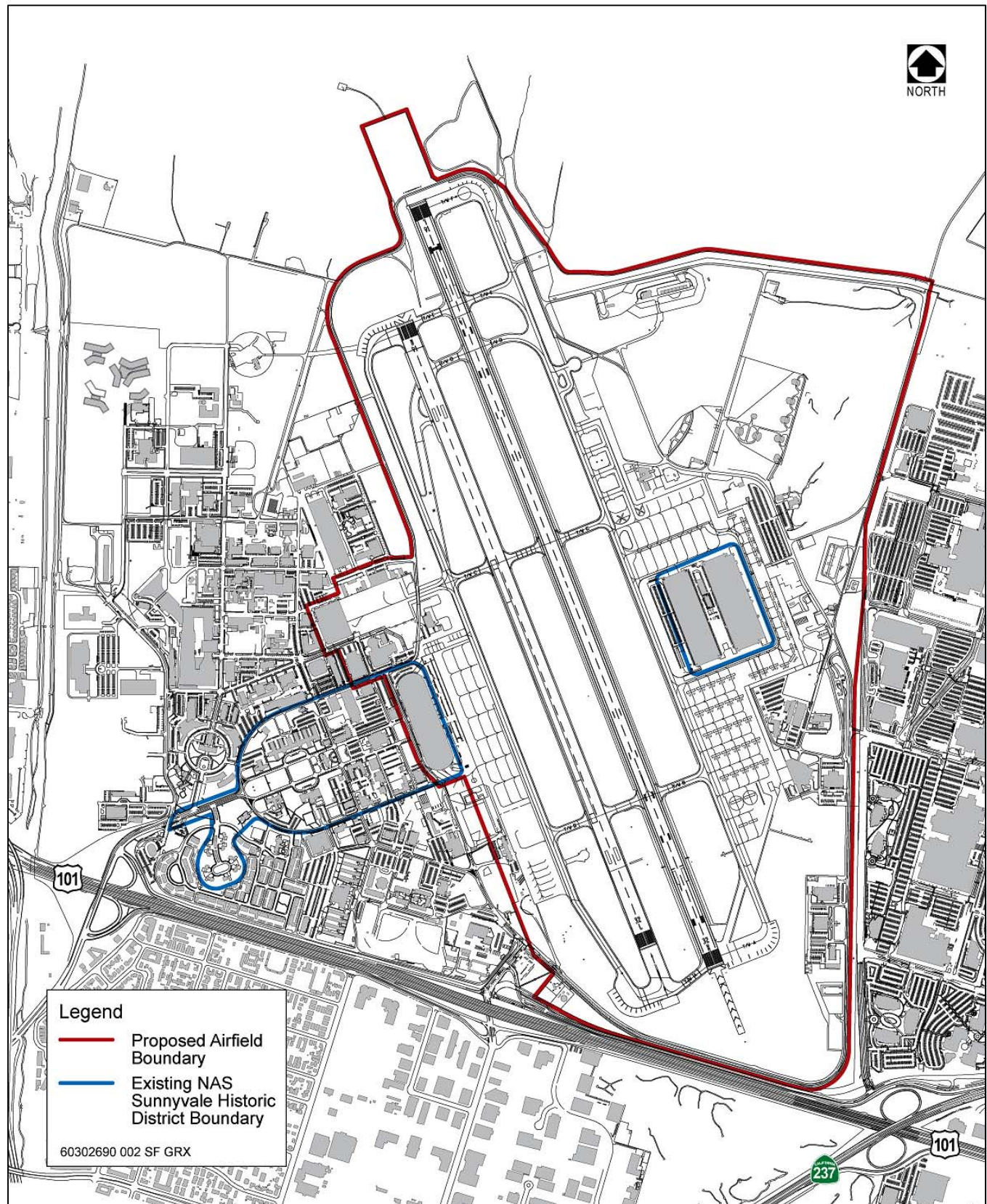
- Flat topography.
- Broad, open views across aviation areas.
- Long views to the salt ponds and San Francisco Bay.
- The expansive, linear system of aviation circulation, dominated by the two parallel concrete-paved runways and their associated taxiways. Associated contributing structures include Runway 14R-32L, Instrument Runway 32R-14L, west and east parallel taxiways, and the aircraft compass calibration pad.

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- The historic hangars and other aviation facilities that define the edges of the aviation areas. These include Hangars 1, 2, and 3; the NASA/NACA hangar; and the CANG area hangar. Even if some of these buildings and structures do not retain individual integrity (because of factors such as interior renovations or changes to exterior materials), their presence supports the historic spatial character and texture of the Airfield landscape.
 - Visual dominance of Hangar 1 from all areas.
 - Views to aircraft maintenance Hangars 2 and 3, framing the east side of the runway areas and visually balancing Hangar 1 on the west side. The three hangars are all contributing features of the NAS Sunnyvale Historic District, but their massing and exterior appearance support the historic character and integrity of the Airfield and the landscape's spatial arrangement.
 - The concrete aircraft parking aprons, with their grid-like texture, adjacent to the hangars.
 - Historic aircraft fueling features that relate to early-1950s use of the Airfield, including the high-speed fueling pits and tank truck filling rack. These appear to no longer be in use.
 - The features at the northeastern edge of the Airfield that are associated with historic ammunition storage and handling, including the row of four heavily fortified, earthen-walled ordnance magazines; the inert ammunition storage building; the two high-explosive magazines; the ordnance handling pad; the fuse and detonator magazine; and the associated open space of the safety buffer zone that has historically been part of the design specifications for such magazines.
 - The distinctive structures and buildings associated with historic aviation lighting, such as the architecturally unusual north and south floodlight towers adjacent to Hangar 1 and the airfield lighting vault.
 - The collective design of buildings and structures lending a “futuristic grandeur” to the appearance of the Airfield and NAS Sunnyvale Historic District together (Gleason 1958).
 - Ongoing aviation use.

5.4 BOUNDARY JUSTIFICATION

This study recommends that the Airfield and its contributing features are eligible for listing as an extension of the NAS Sunnyvale Historic District, which is already listed in the NRHP. Thus, the discussion of the boundary necessarily suggests the need to expand the boundary of the NAS Sunnyvale Historic District to encompass the Airfield (see Figure 3, “Proposed Revised Boundary, NAS Sunnyvale Historic District”).

The Airfield encompasses historic features directly associated with the facility's core aircraft, transport, research, maintenance, and training mission, which has evolved throughout its history. These features include those used to support operations involving dirigibles, balloons, airplanes, rotorcraft, and jets. The facilities directly associated with this use include circulation features used by aircraft, such as runways, taxiways, parking and repair aprons, and compass calibration pads; buildings used to house aircraft, such as hangars; and buildings and structures directly involved in aviation operations, such as fuel transport and storage systems, repair shops, control towers, and aids to navigation (such as airport lighting). The eligible Airfield also includes research and training facilities that rely on their adjacency to aviation features, as well as resources such as administrative facilities that indirectly support aviation functions; open spaces that provide safety buffers between the flight zone and munitions; and some hazardous elements of a military airfield such as fueling areas, munitions storage and loading facilities, and areas used by test vehicles.



Source: Data compiled by AECOM in 2013

Figure 3. Proposed Revised Boundary, NAS Sunnyvale Historic District

The corresponding boundary line follows the current outer fenceline along the northern, eastern, and southern boundaries of the NASA ARC, inclusive of the vehicular roadway that is used to access the eastern Airfield areas from the operational center of the NASA ARC on the west. The boundary is a bit more complex on the west side, where the Airfield abuts the research center. North of Hangar 1, the boundary corresponds to the current fenceline, which incorporates the small apron in front of historic Hangars 210 and 211 and the flight-related buildings that face this apron. At Hangar 1 the boundary would defer to the existing NAS Sunnyvale Historic District boundary line as it follows the NAS Sunnyvale Historic District to the west and south, and back in to encompass Hangar 1 on the south. Heading in a southerly direction from the southeast corner of Hangar 1, the revised boundary runs parallel to the runways to the point where it meets Cody Road (including the flight operations building), and then meets with the current outer fenceline around the southeast end of the NASA ARC, inclusive of the vehicular roadway and communications structures south of the security guard station.

6.0 TREATMENT

6.1 MANAGEMENT CONTEXT

NASA developed a historic resources protection plan (HRPP) in 2002. The HRPP consists of a 10-year programmatic agreement between NASA ARC, the SHPO, and the Advisory Council on Historic Preservation. The agreement, which became effective November 15, defines the historic preservation management plan for the NASA Research Park, including the NAS Sunnyvale Historic District at Moffett Field (NASA 2002a). The HRPP expired in 2012. NASA ARC is preparing an integrated cultural resources management plan (ICRMP) in accordance with current NASA standards, to serve as the management tool for historic properties for the next decade. The results of this study will be incorporated into the ICRMP.

The ICRMP will also identify other treatment and planning tools that may be necessary for ongoing stewardship of the NAS Sunnyvale Historic District (including the Airfield). Currently 98 acres in the southeast portion of the Airfield are encumbered by a permit to the U.S. Air Force with respect to the CANG Cantonment Area. NASA ARC is considering options for leasing out other portions of the Airfield area. NASA and the U.S. General Services Administration have partnered to issue a request for proposals (RFP) to obtain lease proposals from qualified entities to rehabilitate and adaptively reuse historic Hangar 1 and to operate, manage, and maintain Moffett Federal Airfield (NASA 2013a). The RFP includes a requirement for the lessee to rehabilitate and adaptively reuse Hangar 1 and manage and maintain the Airfield in compliance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties and Guidelines for the Treatment of Cultural Landscapes*. The following treatment guidelines are intended to provide NASA and potential lessees with a framework for considering appropriate future uses and treatment approaches for the Airfield's contributing features, in light of its eligible status for inclusion as an extension of the NAS Sunnyvale Historic District.

6.2 TREATMENT APPROACH

The U.S. Department of the Interior currently recognizes four appropriate treatment alternatives for historic properties: preservation, rehabilitation, restoration, and reconstruction. These are defined and discussed in the *Secretary of the Interior's Standards for the Treatment of Historic Properties and Guidelines for the Treatment of Cultural Landscapes* (NPS 1995). Originally, these approaches were developed for historic properties in the NRHP, and were focused on issues specific to buildings and structures. The Secretary of the Interior's guidelines addressing historic landscapes were subsequently developed and appended to these standards. *Guidelines for the Treatment of Cultural Landscapes* were appended to the Secretary of the Interior's standards in 1992, when the standards were revised so that they could be applied not just to buildings and structures, but also to sites, objects, districts, and landscapes.

National Park Service *Director's Order-28: Cultural Resource Management Guideline* (1998), adapted from historic-property treatment guidance, also provides specific guidance for treatment of landscapes. Director's Order 28 provides the following definitions of the four treatment alternatives for cultural landscapes:

- *Preservation* maintains the existing integrity and character of a historic property by arresting or retarding deterioration caused by natural forces and normal use. It includes both maintenance and stabilization. Maintenance is a systematic activity mitigating wear and deterioration of a historic property by protecting its conditions. In light of the dynamic qualities of a landscape, maintenance is essential for the long-term

preservation of individual features and integrity of the entire landscape. Stabilization involves reestablishing the stability of unsafe, damaged, or deteriorated resources while maintaining their existing character.

- *Rehabilitation* improves the utility or function of a historic property, through repair or alteration, to make possible an efficient, compatible use while preserving those portions or features that are important in defining its significance.
- *Restoration* accurately depicts the form, features, and character of a cultural landscape as it appeared at a specific period or as intended by its original constructed design. It may involve the reconstruction of missing historic features and cultural value in themselves.
- *Reconstruction* entails depicting the form, features, and details of a nonsurviving cultural landscape, or any part thereof, as it appeared at a specific period or as intended by its original constructed design. Reconstructing an entire landscape is always a last-resort measure for addressing a management objective and should be undertaken only after consultation.

The recommended landscape treatment approach for the Airfield is rehabilitation. Rehabilitation is the appropriate treatment approach wherever an activity requires physical changes to the landscape, such as large-scale repairs, replacement of historic features, and alterations and additions for a new or continued use (new roads, buildings, or parking, for example).

6.3 TREATMENT GUIDELINES

Guidelines for treatment describe how to accomplish needed changes in the landscape without compromising its historic character. The guidelines outlined below are intended to complement the treatment concepts, and to establish a general approach to historic airfield preservation and continuing use. Guidelines are organized by categories: spatial organization, archaeological resources, views and viewsheds, circulation, historic buildings and structures, small-scale features, land use, topographic modifications, additional studies, and new construction. These sections give general recommended actions to meet the goals of resource preservation.

Rehabilitation standards acknowledge the need to alter or add to a cultural landscape to meet continuing or new uses while retaining the landscape's historic character (NPS 1995):

In Rehabilitation, the historic landscape's character-defining features are protected and maintained. The Secretary of Interior's Standards for Rehabilitation permit the replacement of deteriorated, damaged, or missing features using either traditional or substitute materials. Of the four treatments, only Rehabilitation includes an opportunity to make possible an efficient contemporary use through alterations and additions.

The following general preservation actions are associated with rehabilitation (NPS 1995):

- **Identify, Retain, and Preserve Historic Materials and Features:** Any treatment of historic landscapes begins with identification of the features and materials that are important to the landscape's historic character and must be retained.
- **Protect and Maintain Historic Features and Materials:** Protection generally involves the least degree of intervention and is preparatory to other work; it may be accomplished through permanent or temporary measures. For example, protection includes restricting access to fragile earthworks or cabling a tree to protect

against breakage. Maintenance includes daily, seasonal, and cyclical tasks and the techniques, methods, and materials used to implement them.

- **Repair Historic Features and Materials:** When existing conditions of character-defining materials and portions of features warrant more extensive work, repairing is recommended. Rehabilitation guidance for the repair of historic features and materials begins with the least degree of intervention possible. Repairing also includes the limited replacement in kind of extensively deteriorated materials or parts of features. Using material that matches the historic in design, color, and texture is always the preferred option; however, substitute material is acceptable if the material conveys the same visual appearance as the historic period.
- **Replace Deteriorated Historic Materials and Features:** Following repair in the hierarchy, rehabilitation guidance is provided for replacing an entire character-defining feature with new material because the level of deterioration or damage precludes repair. The preferred option is always replacement of the entire feature in kind. Because this approach may not always be technically, economically, or environmentally feasible, the use of compatible substitute materials can be considered. Whatever level of replacement takes place, the historic features and materials should serve as a guide to the work. Although the rehabilitation guidelines recommend replacing an entire feature that is extensively deteriorated or damaged, they never recommend removing the feature and replacing it with new material if repair is possible.
- **Design for the Replacement of Missing Historic Features:** When an entire feature is missing, the landscape's historic character is diminished. Accepting the loss is one possibility; however, where an important feature is missing, its replacement is always recommended in the rehabilitation guidelines as the first or preferred course of action. Thus, if adequate historical, pictorial, and physical documentation exists so that the feature may be reproduced accurately, and if it is desirable to reestablish the feature as part of the landscape's historical appearance, then planning, designing, and installing a new feature based on such information is appropriate. A second course of action for the replacement feature is to create a new design that is compatible with the remaining character-defining features of the historic landscape. The new design should always take into account the spatial organization and land patterns, features, and materials of the cultural landscape itself; most importantly, the new design should be clearly differentiated so that a false historical appearance is not created.
- **Alterations/Additions for New Use:** When alterations to a historic landscape are needed to assure its continued use, it is most important that such alterations do not radically change, obscure, or destroy character-defining spatial organization and land patterns or features and materials. Such work may also include selectively removing features that detract from the overall historic character. Installing additions to a historic landscape may seem to be essential for a new use; however, the rehabilitation guidelines emphasize that such new additions should be considered only after it is determined that those needs cannot be met by altering secondary (i.e., non-character-defining) spatial organization and land patterns or features. If alternative solutions have been thoroughly evaluated and a new addition is still judged to be the only viable alternative, the addition should be planned, designed, and installed to be clearly differentiated from the character-defining features so that these features are not radically changed, obscured, damaged, or destroyed.

6.3.1 Spatial Organization

Spatial organization is the arrangement of elements that define and create spaces in the landscape. This is an essential part of a functional landscape such as the Airfield. Consider retaining the open qualities of the runways and taxiways, framed by the large Hangars 1, 2, and 3. Avoid adding new, vertical features within the open, broad

expanse of paving. Consider adding any new buildings and structures as infill within other areas. Retain the open areas around the munitions magazines that compose the safety arcs for explosives.

6.3.2 Archaeological Resources

Most of the archaeological resources identified at NASA ARC date to the prehistoric and early historic periods; therefore, they predate the Airfield. Should intact archaeological sites be encountered, much could be learned about the indigenous occupation and subsequent settling of the Sacramento–San Joaquin Delta vicinity. The overall stewardship goal for archaeological sites is protection from disturbance and monitoring of any undertakings that may affect archaeological resources. Any projects involving ground disturbance will adhere to NASA’s unexpected-discovery plan, in accordance with Title 36, Section 800.11 of the Code of Federal Regulations. Similarly, projects will comply with the Native American Graves and Repatriation Act and its implementing regulations.

6.3.3 Views and Viewsheds

Views are a critical aspect of the Airfield’s character. The overall stewardship goal is to retain the views that have consistently been part of the Airfield’s appearance over time. In particular, the open views along and across the runway area, featuring the visually prominent Hangars 1, 2, and 3, and the views of the surrounding setting such as San Francisco Bay and the salt ponds should be preserved. For example, if new, vertical features are being considered for addition to the landscape, avoid placing them along the runway alignments or near the facades of the hangars.

6.3.4 Circulation

Circulation includes roads as well as aviation features such as runways and taxiways. Retain the existing historic patterns of circulation, such as road alignments and widths, and runway and taxiway alignments. Retain and maintain historic paving materials. Consider repairing or replacing damaged and worn historic materials in-kind to preserve the appearance of features such as the concrete runways and historic curbing.

6.3.5 Historic Buildings and Structures

The focus of landscape treatment is on building exteriors and forms as they affect the landscape, not building interiors or detailed structural and engineering recommendations. In general, alterations to contributing buildings and structures that significantly change the massing and exterior appearance may have an impact on the integrity of the District. Retain and maintain the historic Hangars 1, 2, and 3. Maintain the exterior appearance of Hangars 2 and 3, and consider replacing the missing exterior cladding of Hangar 1 with materials that replicate its appearance in the historic period (1930–1961). Coordinate other exterior alterations to contributing buildings with guidance documents such as the ICRMP to ensure compliance with appropriate standards.

6.3.6 Small-Scale Features

Small-scale landscape features include both historic features (such as stone and concrete markers) and nonhistoric ones (such as signs and memorials). Many of these features have changed over time; they largely serve the Airfield’s functional needs, and historic small-scale features were removed as they became obsolete. Identify

historic small-scale features and, if practicable, preserve in-place; if they must be removed, consider moving them to another location if they could serve a memorial or interpretive purpose. If not, document thoroughly before removing.

6.3.7 Land Uses

As noted above, continuing aviation uses fundamentally support the ongoing significance of the Airfield. Insofar as possible, continue to use the Airfield and its associated features for aviation functions. Other uses and activities within buildings and structures that do not require exterior alterations to historic resources may also be appropriate. Avoid introducing incompatible land uses and associated construction within the Airfield area. Refer to guidance provided in historic preservation management documents such as the ICRMP.

6.3.8 Topographic Modifications

Topographic modifications include areas that have been graded. The Airfield is distinguished by its flat topography. Maintain the level character of the area, and avoid adding significant areas of cut and fill as part of construction activities within the Airfield site.

6.3.9 Recommended Studies

Consider undertaking historic structure reports for historic buildings and structures to detail their conditions. Provide technical guidance on material conservation and structural treatment for repair, stabilization, and other future actions. Additional studies may be identified in the ICRMP, which is in progress.

6.3.10 New Construction

New additions and adjacent or related new construction should be undertaken in such a manner that, should the additions or construction elements be removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.

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7.0 REFERENCES AND SOURCES CONSULTED

- Advisory Council on Historic Preservation. n.d. *Program Comment for World War II and Cold War Eras (1939–1974) Ammunition Storage Facilities*. Washington, DC.
- . 1991. *Balancing Historic Preservation Needs with the Operation of Highly Technical or Scientific Facilities*. Excerpt. Available: <http://www.achp.gov/balancingsum.html>. Last updated June 12, 2002.
- Anderson, J. D. Jr. n.d. Chapter 3: Research in Supersonic Flight and the Breaking of the Sound Barrier. Available: <http://history.nasa.gov/SP-4219/Chapter3.html>.
- Bennyhoff, J. A. 1977. *Ethnography of the Plains Miwok*. CARD Publication No. 5. University of California, Davis.
- Fredrickson, D. A. 1974. Cultural Diversity in Early Central California: A View from the North Coast Ranges. *Journal of California Anthropology* 1(1):41–54.
- Garaventa, D. M., and R. Anastasio with A. M. Banet, S. A. Guedin, and S. J. Rossa. 1991 (December). *Archaeological Overview and Survey. Naval Air Station Moffett Field, Santa Clara County, California and Naval Auxiliary Landing Field Crows Landing, Stanislaus County*. Basin Research Associates, Inc.
- Gleason, S. 1958. *Moffett Field, California, Naval Air Station, Silver Anniversary, 1933–1958*. San Jose, CA: Globe Printing Company.
- Kroeber, A. 1925. *Handbook of Indians of California*. Bureau of American Ethnology Bulletin 78. Washington, DC: Government Printing Office.
- Loechl, S. K., S. A. Batzli, and S. I. Ensicore. n.d. *Guidelines for Documenting and Evaluating Historic Military Landscapes: An Integrated Landscape Approach*. An AEC Technical Guideline prepared by U.S. Army Corps of Engineers Resource Library. Available: <http://aec.army.mil/usaec/cultural/milland.pdf>.
- Moffett Field Historical Society Museum collection.
- Moratto, M. [1984] 2004. *California Archaeology*. Reprint. Salinas, CA: Coyote Press.
- NASA. See National Aeronautics and Space Administration.
- National Aeronautics and Space Administration. 2002a (June). *NASA Ames Research Center Historic Resources Protection Plan for Portions of Moffett Field, California*. Prepared for NASA Ames Research Center.
- . 2002b (December). *NASA Ames Development Plan*. Office of the Assistant Director for Development. Available: http://www.nasa.gov/sites/default/files/578481main_nadp_dec_02-1.pdf
- . 2009 (November). *Environmental Resources Document*. Final. Washington, DC.
- . 2012. Hangar 1, Shenandoah Plaza Historic District. Available: <http://historicproperties.arc.nasa.gov/hangar1.html>. Last updated October 2012. Accessed July 2013.

———. 2013a. *Moffett Federal Airfield Construction History and Historical Significance*. Report prepared for California State Historic Preservation Office.

———. 2013b (May 28). *Request for Proposals: Rehabilitation and Adaptive Reuse of Hangar One and Management of Moffett Federal Airfield*. Mountain View, CA: NASA Ames Research Center.

National Park Service. n.d. *How to Evaluate and Nominate Designed Historic Landscapes*. National Register Bulletin 18. Interagency Resources Division, Washington, DC.

———. 1995. *Secretary of the Interior's Standards for the Treatment of Historic Properties and Guidelines for the Treatment of Cultural Landscapes*. Washington, DC.

———. 1997. *How to Apply the National Register Criteria for Evaluation*. National Register Bulletin 15. Published 1990; revised 1991, 1995, 1997. Washington, DC.

———. 1998a. *Guidelines for Evaluating and Documenting Historic Aviation Properties*. National Register Bulletin 43. Washington, DC.

———. 1998b. *Guide to Cultural Landscape Reports: Contents, Process, and Techniques*. Cultural Resource Stewardship and Partnerships, Park Historic Structures and Cultural Landscapes Program.

———. 1999. *Guidelines for Identifying, Evaluating, and Registering America's Historic Battlefields*. National Register Bulletin 40. Published 1992; revised 1999. Washington, DC.

———. 2004. *American Aviation Heritage*. National Historic Landmark Theme Study. Updated spring 2004. Washington, DC. Available: <http://www.nps.gov/nhl/themes/Spring%202004%20Update.pdf>.

Navy. *See* U.S. Department of the Navy.

NPS. *See* National Park Service.

Urban Programmers. 1994. *National Register of Historic Places District Nomination: US. Naval Air Station Sunnyvale, California Historic District*. Nomination prepared for National Park Service.

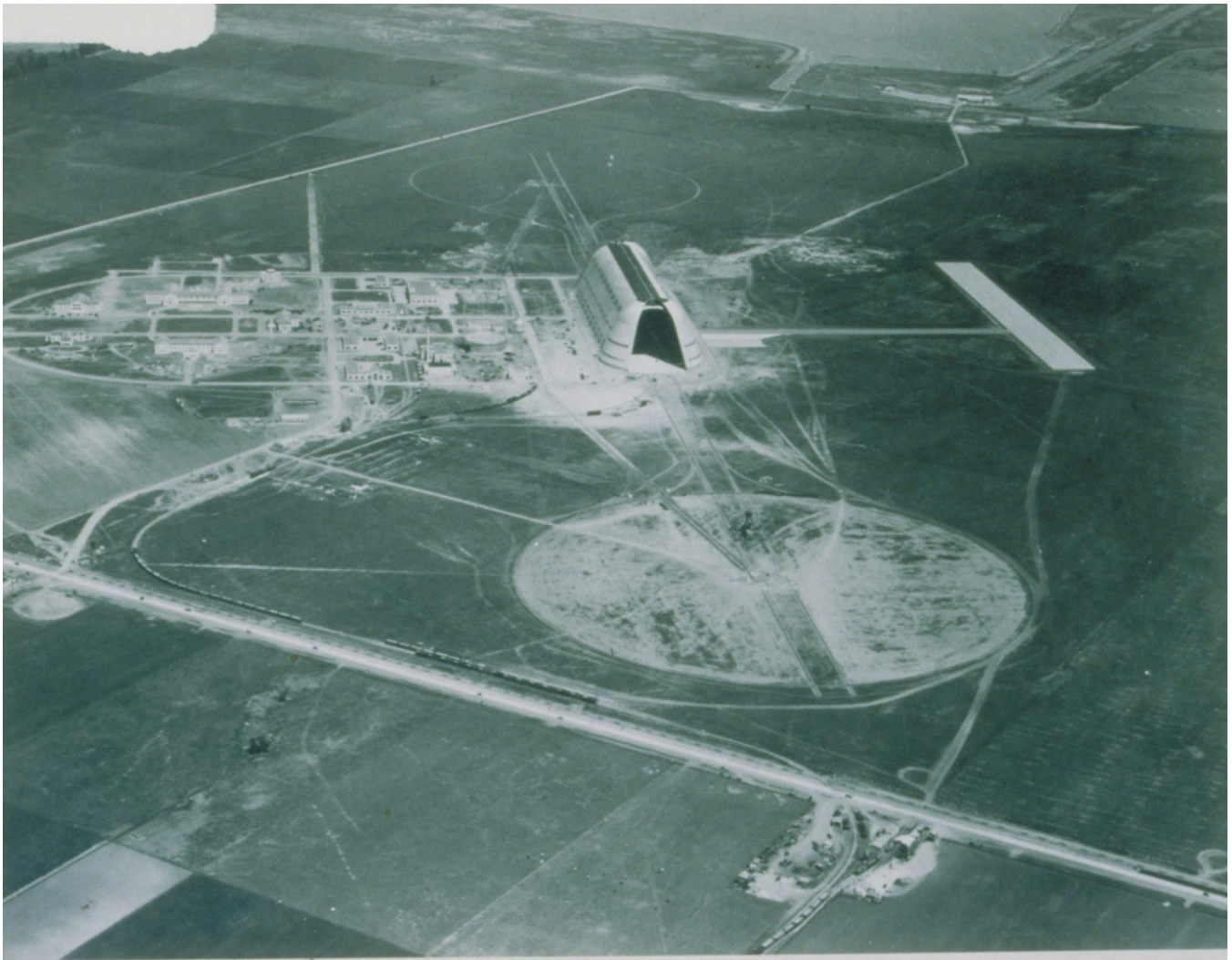
U.S. Department of the Navy. 1954. *U.S. Naval Air Station Moffett Field Master Shore Development Plan*.

———. 1963. *Naval Air Station, Moffett Field, 1933–1963: 30th Anniversary*. Moffett Field.

Veronico, N. 2006. *Moffett Field*. Charleston, SC: Arcadia.

APPENDIX A

Selected Historic Photographs



Early aerial photograph of NAS Sunnyvale showing Shenandoah Plaza at center left, Hangar 1 with the mooring circles for the *USS Macon*, and the original runway configuration for the *Sparrowhawk* planes at center right, c. 1933 (Source: *Moffett Field Historical Society*)



Aerial photograph of NAS Sunnyvale with Hangar 1 at upper right and larger runway system at center and left, c. 1934-1938
(Source: *Moffett Field Historical Society*)



Aerial photograph of NAS Sunnyvale, c. 1938 (*Source: NASA Ames History Office*)



Aerial photograph of NAS Moffett Field with new runway configuration and safety buffer zone under construction, July 25, 1943 (Source: NASA Ames History Office)



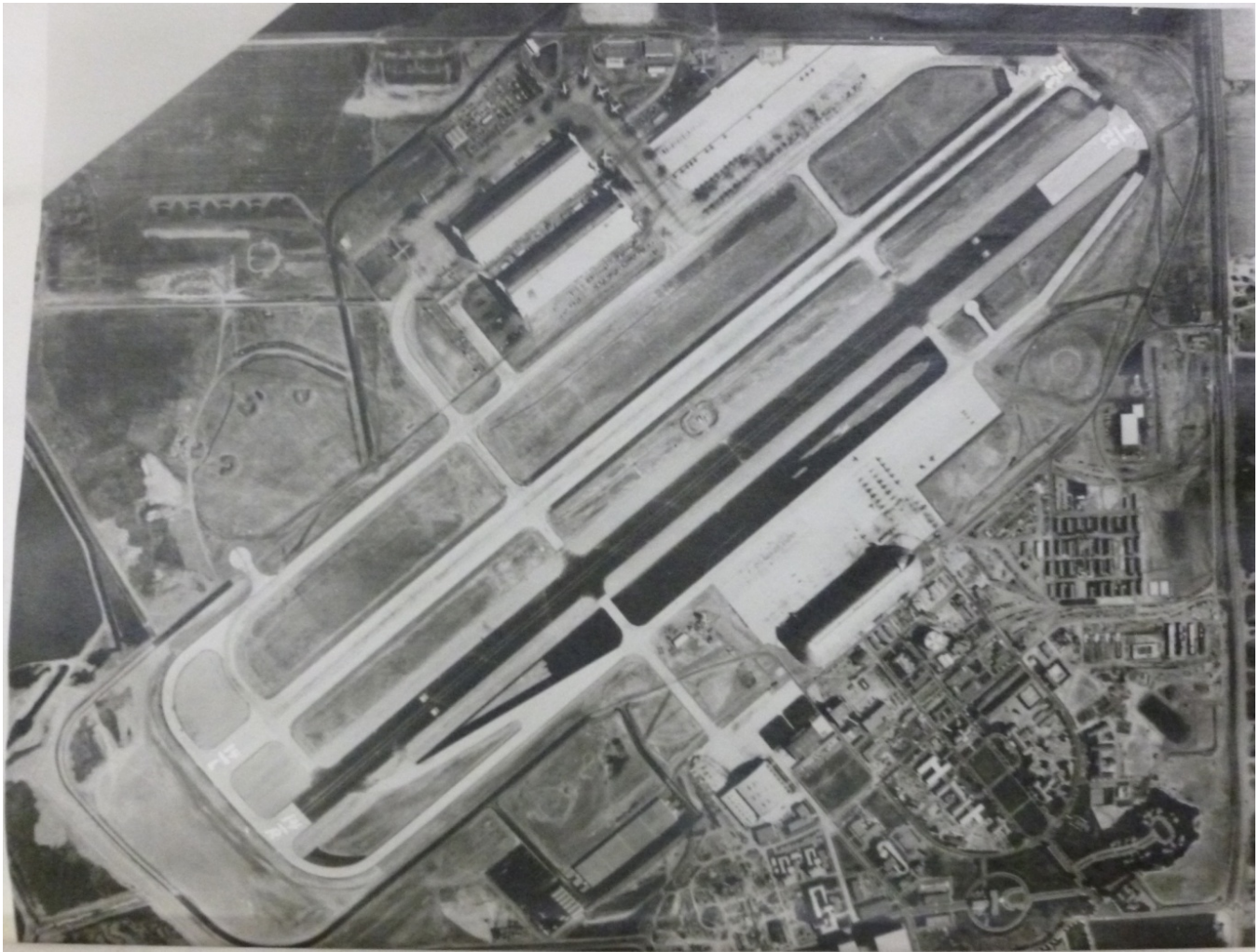
Aerial photograph of NAS Moffett Field showing recently completed Hangars 2 and 3 at center right and future CANG area at lower left, 1944 (Source: *Moffett Field Historical Society*)



Aerial photograph of NAS showing the completed magazines and safety buffer zone, c. 1945 (*Source: NASA Ames History Office*)



Aerial photograph of NAS Moffett Field during Naval Air Transport Service period, 1947. Note taxiway and apron in front of NACA hangars to the left of Hangar 1. (*Source: Moffett Field Historical Society*)



Aerial photograph of NAS Moffett Field after new ramps and taxiways were installed and the runways were extended, 1953
(Source: *Moffett Field Historical Society*)



Aerial photograph of NAS Moffett Field after more modifications to the airfield and extensions to the runways, 1967. Note the addition of the golf course at lower right. (*Source: Moffett Field Historical Society*)

APPENDIX B

Selected Existing Conditions Photographs



Panoramas of the Airfield. Looking north and northeast toward Hangars 1, 2, and 3 (top); looking east toward CANG and south toward the end of the runways (bottom) (*Source: AECOM 2013*)



View from north end of runways looking south toward Hangars 1, 2, and 3 (*Source: AECOM 2013*)



Detail view of Runway 14R-32L looking south (*Source: AECOM 2013*)



View of east parallel taxiway looking south toward Hangars 2 and 3 (*Source: AECOM 2013*)



View of magazines 70-74 and surrounding safety buffer zone, looking east (*Source: AECOM 2013*)



View of Hangar 1 looking northwest (*Source: AECOM 2013*)



View of Hangars 2 and 3 looking northwest (*Source: AECOM 2013*)

APPENDIX C

Preliminary Inventory of Contributing Airfield Features

This list represents a preliminary identification of contributing features. Other features located within the Airfield may date to the period of significance but are not included in this inventory because their construction dates, integrity, or condition could not be determined, or because they could not be accessed during the field survey. Further evaluation to determine if these features are contributors may be required in future studies.

Table C-1. Preliminary Inventory of Contributing Airfield Features

Feature Number	Feature Name	Estimated Construction Date	Historic Use	Contributor to the Existing NAS Sunnyvale NR District?	Proposed New Contributor to NAS Sunnyvale NR District?
001	Hangar One	06/01/1933	Aircraft Maintenance Hangar	YES	NO
032	North Floodlight Tower	01/01/1934	Aviation Operations Building	YES	NO
033	South Floodlight Tower	01/01/1934	Aviation Operations Building	YES	NO
046	Aircraft Maintenance Hangar 2	1943	Aircraft Maintenance Hangar	YES	NO
047	Aircraft Maintenance Hangar 3	1943	Aircraft Maintenance Hangar	YES	NO
069	Inert Ammunition Storage	06/01/1943	Inert Storehouse - Bulk	NO	YES
070	Fuse & Detonator Magazine	03/01/1943	Fuse and Detonator Magazine - Ready Issue	NO	YES
071	High Explosive Magazine	08/01/1943	Explosive Storage (Miscellaneous)	NO	YES
072	High Explosive Magazine	08/01/1943	Explosive Storage (Miscellaneous)	NO	YES
073	High Explosive Magazine	08/01/1943	Explosive Storage (Miscellaneous)	NO	YES
074	High Explosive Magazine	08/01/1943	Explosive Storage (Miscellaneous)	NO	YES
105	Airfield Lighting Vault	12/01/1947	Substation. Historically this transformer provided light for the airfield	NO	YES
106	Aircraft Compass Calibration Pad (Compass Rose)	12/01/1947	Compass Calibration Pad, Surfaced	NO	YES
141	Tank Truck Filling Rack	12/01/1952	Aircraft Truck Fueling Facility	NO	YES
143	High Explosive Magazine	05/01/1951	Explosive Storage (Miscellaneous)	NO	YES
147	High Explosive Magazine	05/01/1951	Explosive Storage (Miscellaneous)	NO	YES
158	Flight Operations Building (Tower)	1954 (Feb)	Flight operations	NO	YES
329	Ultra High Frequency/Very High Frequency (UHF/VHF) Receiver Building	1958	Facilitate air traffic control communications	NO	YES
442	Ordnance Handling Pad	04/01/1956 (Likely 1951 or 1952)	Taxiway (Concrete)	NO	YES

Table C-1. Preliminary Inventory of Contributing Airfield Features

Feature Number	Feature Name	Estimated Construction Date	Historic Use	Contributor to the Existing NAS Sunnyvale NR District?	Proposed New Contributor to NAS Sunnyvale NR District?
454	Transmission Building Uhf/Vhf	12/31/1960	Communications Building. Facilitates air traffic control communications.	NO	YES
MF1000	Runway 32l/14r	Originally Constructed in 1938 (Later Extended)	Runway (Concrete)	NO	YES
MF1001	Instrument Runway 32r/14l	12/31/1945 (Later Extended)	Runway (Concrete)	NO	YES
MF1002	Aircraft Parking Apron	05/01/1945	Aircraft Parking, Access or Maintenance Apron (Concrete)	NO	YES
MF1003	Hi-Speed Aircraft Fueling Pits	12/01/1955	Aircraft Direct Fueling Station	NO	YES
MF1016	West Parallel Aircraft Taxiway	c. 1946	Taxiway (Concrete)	NO	YES
MF1016	East Parallel Aircraft Taxiway	c. 1946	Taxiway (Concrete)	NO	YES
MF1016	Connecting Taxiways	c. 1946	Taxiway (Concrete)	NO	YES

APPENDIX D

Period Plans

